ORIGINAL ARTICLE

Functional outcome of Microvascular Decompression for Trigeminal Neuralgia (TN)

IHSANULLAH, KHALID KHANZADA, MUSAFIR ALAM, HAMEEDULLAH
Department of Neurosurgery, Medical Teaching Institution, Lady Reading Hospital, Peshawar Pakistan

ABSTRACT

Objective: *To know functional outcome of microvascular decompression in trigeminal neuralgia.*

Materials and Methods: *This prospective study was conducted in the Department of Neurosurgery Lady Reading Hospital Peshawar from July 2014 to Dec. 2017. Patients with idiopathic trigeminal neuralgia with failed medical treatment were included in this study. A Barrow Neurological Institute pain score was calculated for all patients' pre and post operatively. Microvascular decompression was done in all cases and follow up done in the outpatient department of all operated cases.*

Results: *Thirty six patients were included in the study and operated for trigeminal neuralgia. Pre-operatively 20 (55.5%) patients had a score of 5 and 16 (44.4%) had a score of 4. Postoperatively, at the last clinic follow up, 18 patients (48.6%) had a score of 1 while 15 (37.8%) had a score of 3 and 3 (8.1%) had a score of 4. Complication developed in nine cases which included cerebrospinal fluid leak (3 patients), 1 patient hearing loss, 2 patients developed wound infection, 1 patient meningitis and cerebellar hematoma in 1 patient.*

Conclusion: *Good preoperative workup in the form of history, physical examination, radiological workup and microsurgical techniques are pivotal for a successful outcome. Microvascular decompression is currently a safe and effective treatment option for patients having trigeminal neuralgia not responding to medical management.*

Abbreviations: *BNIP: Borrow Neurological Institute Pain Scale. TN: Trigeminal Neuralgia. TNS: Trigeminal Nerve System. MVD: Microvascular Decompression. CSF: Cerebrospinal Fluid.*

Keywords: *Trigeminal neuralgia, Microvascular decompression, Borrow neurological institute pain scale.*

INTRODUCTION

Trigeminal neuralgia (TN) is well known disease for the physicians since ancient times. Aretaeus of Cappadocia described one sided facial pain causing spasmodic facial contraction in the 2nd century A.D. An Arab physician Jujani also mentioned Trigeminal neuralgia in the 11th century A.D. Typical symptoms of TN was described by John Fothergill in 1773.[1] Episodic nature of symptoms and its association with certain activities like tactile pressure, chewing, brushing, breeze of air, or speaking was noted by Fothergill. The term "tic douloureux" was used for the first time by the French surgeon Nicholas André in 1756.[2] Trigeminal neuralgia has fascinated an extensive cohort of scientists, including but not limited to pathologist, dentists, neurologists, neurosurgeons, physicians, ophthalmologist and psychiatrists. The etiological myth of TN still remains controversial. Contemporary popular theories are based on three main etiologic causes. The first theory is based on organic causes leading to TN due vascular pathologies, multiple sclerosis, diabetes mellitus, rheumatism and others. Direct injury to peripheral or central portion of the trigeminal nerve may be one of the inciting causes of the disease by some researchers. A third hypothesis stress more on the polyetiologic origin of the disease resulting in demyelination and atrophy of the nerve.[3]

Scientific evidence to support each hypothesis is lacking and in most of the cases, no cause can be found. Patients with TN also suffer from other vascular pathologies like atherosclerosis and scientists also found changes in blood rheology in these blood

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vessels which supplies the trigeminal nerve system (TNS). Scientific evidence for such hypothesis is lacking.[3] However, these changes in the blood vessels do influence the disease. Multiple sclerosis (MS) is also linked with the etiology of TN. Only a small percentage of MS patients suffer from TN (0.9% to 4.5%) and TN may be the first manifestation of MS in 9% – 14% patients.[4-6]

Table 1: *Definition and classification of TN.*[2]

Symptoms	Classification
Idiopathic	
1. Electric shock like sharp,episodic pain with clear pain free interval	TN 1
2. Pain which is throbbing, aching and burning, with a background constant pain >50% of time	TN 2
	Trigeminal neuropathic pain
Trigeminal injury	
1. Nerve injury due to trauma, skull base surgery (unintentional injury)	Trigeminal deafferentation pain
2. Intentional (neurectomy, gangliolysis, rhizotomy etc.)	Symptomatic TN
Associated with MS	Postherpetic TN
Nerve involvement due to herpes zoster	Atypical facial pain
Psychosomatic pain disorder	

MATERIAL AND METHODS

Study Design

Descriptive case series.

Approval for this study was taken from the hospital ethical committee. This descriptive study was done in the Department of neurosurgery lady reading hospital Peshawar from July 2014 to December 2017 (3 years 6 months).

Inclusion Criteria

All patients of idiopathic trigeminal neuralgia with failed medical therapy were included in this study. Informed consent was taken from all patients.

Exclusion Criteria

Preoperative workup included detail history, a comprehensive general and neurological examination and MRI of the brain with and without contrast. Patients having a TN due tumor in the cerebellopontine angle, MS, those with nerve injury due to trauma or surgery, those whose disease was controlled on pharmacological treatment or those refusing surgery were excluded from the study.

Data Collection Procedure

All data was collected by its entry on special design performa.

Patients were assessed post operatively by Borrow neurological institute pain scale (BNIP scale for pain relief (Table 2) and findings were documented on predesigned Pro forma. A patient whose disease was refractory to surgery was put again on drug treatment.

Table 2: *Borrow neurological institute pain scale (BNIP).*

Score	Pain description
I	No clinical evidence of disease, no medication required
II	Occasional pain, no medication required
III	Patient takes medications for pain and symptom controlled by medications.
IV	Patient have pain and is not controlled by medication
V	Patient is having no relief from pain and still suffers excruciating pain.

Surgical Technique

The patient is positioned in the lateral (park bench) position, and the head tilted 10 degrees toward the floor for better visualization of the trigeminal nerve. A small linear (3-5 cm) incision is given 1 cm behind the mastoid groove, dissection carried out until asterion identified. A small (2x3cm) retromastoid craniectomy is done exposing the sigmoid and transverse sinus junction. The dura is opened in a "Y" shaped and anchored to the wound edges. Cerebrospinal fluid is released to allow the cerebellum to fall back. The angle between tentorium and the petrous bone is followed till the trigeminal nerve is identified. Arachnoid dissection is done sharply around the trigeminal nerve from pons to the Meckel's cave. The offending vessel is found in more than 90% of cases. All offending vessels are sharply dissected and nerve totally freed from the conflict. A Teflon nonabsorbable

or absorbable oxidized cellulose or muscle patch, then interposed between the nerve and vessel. Most commonly the superior cerebellar artery is the culprit vessel.

Data Analysis

Data was analyzed by SPSS version 20 and represented in the form of tables, graphs and charts. Post operatively patients were assessed by BNIP after 72 hours for relief of facial pain.

RESULTS

Sex Incidence

Total 36 patients underwent MVD for trigeminal neuralgia from July 2014 to Dec 2017 (42 months) including 21 females and 15 males (Table 3).

Table 3: *Sex Incidence.*

Sex	N	%	Accumulative %
Male	15	42%	42%
Female	21	58%	100%
Total	36	100%	100%

Age Incidence

Age incidence mean age of 51 years (range 31-64).

Outcome

All diagnosed patients with failed medical therapy underwent microvascular decompression (MVD). A Barrow Neurological Institute pain score was calculated for all patients (Table 2). Pre-operatively 20 (55.5%) patients had a score of 5, 16 (44.4%) had a score of 4 (Table 4). Postoperatively, at the last clinic follow up, 18 patients (48.6%) had a score of 1 while 15 (77.8%) had a score of 3 and 3 (8.1%) had a score of 4 (Table 5). A post-operative score of ≤ 3 was considered a satisfactory outcome.

Table 4: *Pre-operative BNIP Score.*

Score	N	%	Accumulative %
4	20	56%	56%
5	16	44%	100%
Total	36	100%	100%

Table 5: *Post-operative BNIP Score.*

Score	N	%	Accumulative %
1	18	50%	56%
3	15	41%	91.6%
4	3	8.4%	100%
Total	36	100%	100%

Complications

Nine patients developed post-operative complications, 3 developed cerebrospinal fluid leak, 1 patient hearing loss, 2 patients developed wound infection, 1 patient meningitis and cerebellar hematoma in 1 patient.

CSF leak in all 3 patients was managed conservatively with bed rest, reinforcement sutures, stool softener and lumber drain in 1 patient. Wound infection and meningitis were treated with antibiotics and cerebellar hematoma also subsided with conservative measures. Postoperative complications are mentioned in Table 6.

Table 6: *Postoperative complications.*

Complications	No of Patient	Percentage %
CSF Leak	3	8.34
Wound infection	2	5.4
Meningitis	0	0
Hearing Loss	1	2.8
Facial Nerve palsy	1	2.8
Post Fossa hematoma	1	2.8
Facial sensory loss (S&N)	0	0
vertigo	1	2.8
Mortality	0	0

Facial weakness also improved with physiotherapy at last follow up (6 months).

DISCUSSION

Microvascular decompression (MVD) of the trigeminal nerve is undertaken through retro-sigmoid craniectomy in those patients who were unable to

tolerate the drugs due to the adverse effects or due to failure of drug treatment to control the pain. All patients were screened with an MRI pre-operatively to rule out other pathological entities like mass lesion or demyelination and to look for any flow void (vessels) in the vicinity of the trigeminal nerve. Vascular loop compressing the trigeminal nerve have better functional outcomes after MVD. Postoperative hearing loss with a reported incidence of 1-1.4% due to close relation of VIII to trigeminal nerve has been reported in the literature.[7,9] Complications of MVD include, but not limited to facial palsy, sensory loss, postoperative hematoma, CSF leak, wound infection and meningitis. In our study, with an average of 9 month post-operative follow up, 33 patients (76%) had a good functional outcome (Barrow score ≤ 3), while 3 (24%) reported an unsatisfactory outcome.

A large study by Barker et al which included a cohort of 1185 patients who received treatment in the form of MVD over a 19-year period reported the same results and findings. Barker reported that 75% of patients were completely pain free after MVD, with a further 9% reporting a partial response. Ten years postoperatively, 64% of patients reported complete relief, and 4% reported partial relief.[9] A study in 2010 by Sarsam et al which included 372 patients treated with MVD between 1982 and 2005 for TN with failed medical therapy reported that 84% of patients were pain-free, without the need for medication, at one year, and that 71% were pain-free without the need for medication at 10 years post-operatively.[10]

Present safe general anesthesia, micro neurosurgical techniques, availability of neuronavigation, and per operative neuromonitoring can further reduce the problems in microvascular decompression surgery.[11] In our series, we observed no mortality or vascular complication in form of intracranial bleed or ischemic event. Neurologic deficit manifested as hearing loss in 1 patient and mild facial weakness (House-Brackmann grade II) in 1 patient, which recovered completely till last the follow-up (6 month). In a large series by Jannetta also founder and advocate for MVD reported a mortality of 0.3% (2 cases) out of 618 cases in the micro vascular decompression surgery and a recurrence rate of about 25% at 4 year follow-up.[12]

Due to the readiness of diagnosis, availability of good quality images, safe general anesthesia and refinement in microsurgical techniques MVD is now the treatment of choice for trigeminal neuralgia in those patients having failed medical treatment.[13,14] With the resurgence of neuroendoscopy endoscopic MVD is revolving quickly with results comparable to open surgery.[16] For cases refractory to medical management or those after failure of MVD other less invasive treatment options are available most of these options are ablative but should always be considered in patients having the co morbid condition precluding general anesthesia or those having limited life expectancy. Various other less invasive ablative procedures like radiofrequency thermocoagulation, glycerol rhizolysis, percutaneous microcompression (balloon microcompression) and stereotactic radiosurgery should always be considered in the elderly and those with co morbid.[17]

These ablative but less invasive procedures carry inherent risk of any facial sensory loss (numbness) which may be annoying for some patients. Recurrence is more common with these when compared to MVD. Abdennebi et al in his retrospective large study of 901 which were treated with balloon micro-compression reported pain relief without the need for medication in 67% of patients at one year follow-up which reduced to 48% at 16 year follow-up.[18]

Stereotactic radiosurgery (SRS) use is increasing because of its least invasive nature in treatment of TN. Using neuronavigation platform highly targeted radiation is delivered to the trigeminal nerve root entry zone. The success rate in term of pain relief is much lower than the MVD with a rate of 51.5% at ten years, followed up has been reported in a recent literature[19]. Onset of action of the SRS is delayed during which time patient will be on medication as compared to other treatment modalities where pain relief is immediate. However, it is still a good option for some patient like those with multiple sclerosis presenting with TN.[20]

CONCLUSION

In conclusion, microvascular decompression is an established safe surgical procedure in patients who disease is resistant to drug treatment or when patient unable to continue drug treatment due to its toxic side effects. However, the rates of post-operative pain reduction in patients undergoing this operation in our center are not at par with the international literature due to the small size of the study. However, this may be also due to a large proportion of patients with negative prognostic factors pre-operatively (e.g., long duration of TN prior to operation), or due to discrepancy in outcome measurement. Neurologists

and other physicians involved in the management of TN should consider referral to a neurosurgical unit following the failure of medical therapy.

ROLE OF AUTHORS

Dr. Ihsanullah: Literature review.
Dr. Khalid Khanzada: Paper Editing and Results Writing.
Dr. Musafir Alam: Paper Writing.
Dr. Hameedullah: Study Design.

Additional Information
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In compliance with the ICMJE uniform disclosure form, all authors declare the following:
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Address for Correspondence:
Dr. Khalid Khanzada
Assistant Professor
Department of Neurosurgery Unit B
MTI, LRH, Peshawar.
Email: drihsan.ns@gmail.com

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